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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,935	06/27/2003	Takafumi Terahara	1344.1120	4453

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EXAMINER	
LI, SHI K	

ART UNIT	PAPER NUMBER
2613	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/606,935	TERAHARA ET AL.	
	Examiner	Art Unit	
	Shi K. Li	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-18,20,22,25 and 26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-18,20,22,25 and 26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12 January 2009 has been entered.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. (S. Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve Multi-Terabit/s Capacities", OFC 2002, 17-22 March 2002) in view of Miyamoto et al. (U.S. Patent 6,865,348 B2) and Ramaswami et al. ("Optical Network: A Practical Perspective" by R. Ramaswami et al., Morgan Kaufmann, 1998, pp. 177-180).

Regarding claims 1 and 17, Bigo et al. teaches in the first paragraph of the *Introduction* WDM transmission system in which signal lights with different wavelengths are multiplexed (see FIG. 1). Bigo et al. teaches in the first paragraph of Centered *filers in transmitter* demultiplexing and receivers at the receiving end. Bigo et al. teaches both NRZ and RZ signal format (see FIG. 1). Bigo et al. teaches in first paragraph of *Centered filers in transmitter* inserting centered optical filters at the transmitting end before wavelength multiplexing (see FIG. 1) for improving spectrum efficiency. The difference between Bigo et al. and the claimed

invention is that Bigo et al. does not teach super-Gaussian filters. However, super-Gaussian filters are well known in the art. For example, Miyamoto et al. teach in FIG. 2B optical filter 82. Miyamoto et al. teaches in FIG. 44D and col. 30, lines 50-55 super-Gaussian filter of order m. One of ordinary skill in the art would have been motivated to combine the teaching of Miyamoto et al. with the WDM transmission system of Bigo et al. because a super-Gaussian filter with order m>1 gives high suppression ratio for crosstalk. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use super Gaussian or order m>l, as taught by Miyamoto et al., in the transmission system of Bigo et al. because a super-Gaussian filter with order m>1 gives high suppression ratio for crosstalk.

The Applicant argues that Bigo et al. teaches in FIG. 1 both RZ and NRZ. Of course, using whether RZ or NRZ for transmission is an engineering choice. Since Bigo et al. teaches either RZ and NRZ can be used for optical transmission, the claimed invention is obvious in view of the combination of Bigo et al. and Miyamoto et al. The Examiner further cites Ramaswami et al. for supporting the using of NRZ. Ramaswami et al. teaches on page 179, 8th line from the bottom, "In practice, the NRZ format is used in most high-speed communication systems." One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible with most other communication systems and can reuse most part of the design and components of other communication systems. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use NRZ for transmission, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible

with most other communication systems and can reuse most part of the design and components of other communication systems.

4. Claims 3-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Ramaswami et al. as applied to claims 1 and 17 above, and further in view of Frankel et al. (U.S. Patent 6,496,297 B1).

Bigo et al., Miyamoto et al. and Ramaswami et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al., Miyamoto et al. and Ramaswami et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Ramaswami et al. do not teach that the spectrum efficiency is 0.574 bit/s/Hz. However, spectrum efficiency is an engineering figure which depends on many factors. For example, Frankel et al. teaches in col. 5, line 51 spectral efficiency of 0.7 bits/s/Hz and teaches in col. 5, line 59-60 that spectrum efficiency may be increased to 1 bit/s/Hz. Literature in the art teaches various spectrum efficiency values and, therefore, specifying a particular value or a particular range of values is not patentable.

Regarding claim 4, given maximum spectral efficiency 0.574 bits/s/Hz, grid I and bit rate B, it is obvious that B/(kI) is the actual spectrum efficiency and B/(kI) must be smaller than or equal to 0.574 bit/s/Hz. The smallest k such that $B/(kI) < 0.574$ bit/s/Hz is the minimum value for k.

Regarding claims 5 and 7, if B/I is 1.6 bit/s/Hz, k=l gives a spectral efficiency of 1.6 bit/s/Hz which is not possible, k=2 gives a spectrum efficiency of 0.6 which is also not possible while k=3 gives a spectrum efficiency of 0.53 which is less than the maximum value.

Regarding claim 6, for I of 25 GHz, frequency spacing is kI = 75 GHz.

Regarding claim 8, set Δf =75 GHz and fb = 40 to 50 GHz give their ratio as 1.875 and

1.50.

Similar arithmetic gives results of claims 9-12.

5. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Ramaswami et al. as applied to claims 1 and 17 above, and further in view of Ramaswami et al.2 ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al. and Ramaswami et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al., Miyamoto et al. and Ramaswami et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Ramaswami et al. do not teach arrayed waveguide grating. Ramaswami et al.2 teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al.2 with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to Use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al.2, in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. as an engineering design choice.

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Ramaswami et al.2 ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. do not teach arrayed waveguide grating. Ramaswami et al.2 teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al.2 with the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al.2, in the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as an engineering design choice.

Note that interleaver using an interference filter is well known in the art. For example, see Gu (U.S. Patent 6,611,340 B2).

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Koshi (U.S. Patent Application Pub. 2002/0025111 A1).

Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Frankel et al. do not teach dielectric multi-layer film filter. Koshi teaches in FIG. 2 a wavelength multiplexer 2. Koshi teaches in paragraph [0099] that Mach-Zehnder interferometer type

wavelength multiplexer, arrayed waveguide grating or dielectric multi-layer filter can be used for multiplexer 2. One of ordinary skill in the art would have been motivated to combine the teaching of Koshi with the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric multi-layer film filter as multiplexer/demultiplexer, as taught by Koshi, in the modified WDM transmission system of Bigo et al., Miyamoto et al., Ramaswami et al. and Frankel et al. as an engineering design choice.

8. Claims 16 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Ramaswami et al. as applied to claims 1 and 17 above, and further in view of Guy (U.S. Patent 6,690,886 B 1).

Bigo et al., Miyamoto et al. and Ramaswami et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al, and Miyamoto et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Ramaswami et al. do not teach calculating spectrum efficiency at which a performance index is maximized. However, Guy teaches in col. 3, lines 39-48 and col. 6, lines 25-35 that spectrum efficiency is a compromise between channel spacing and degradation of signal quality caused by effects such as crosstalk. Therefore, it is obvious for one of ordinary skill in the art to minimize degradation and channel spacing, i.e., maximizing (B/S) and $1/\Delta Q$.

Regarding claims 25-26, instant specification admits on page 12, first paragraph that when the performance index is maximized, the product of a transmission distance and a transmission capacity is also maximized. Furthermore, it has been held that discovering an

optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)

9. Claims 18, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Ramaswami et al. as applied to claims 1 and 17 above, and further in view of Silberberg et al. (U.S. Patent 7,035,484 B2).

Bigo et al., Miyamoto et al. and Ramaswami et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al., Miyamoto et al. and Ramaswami et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Ramaswami et al. do not teach polarization independent filter. Silberberg et al. teaches in col. 14, lines 9-12 and col. 15 lines 43-54 to make filter polarization independent for applications that do not use any particular polarization arrangement because polarization is random if there lacks any polarization control. One of ordinary skill in the art would have been motivated to combine the teaching of Silberberg et al. with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. because using polarization independent filters does not require any particular polarization control. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use polarization independent filters, as taught by Silberberg et al., in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Ramaswami et al. because using polarization independent filters does not require any particular polarization control.

Response to Arguments

10. Applicant's arguments filed 12 January 2009 have been fully considered but they are not persuasive.

The Applicant argues that Bigo et al. teaches in FIG. 1 both RZ and NRZ. Of course, using whether RZ or NRZ for transmission is an engineering choice. Since Bigo et al. teaches either RZ and NRZ can be used for optical transmission, the claimed invention is obvious in view of the combination of Bigo et al. and Miyamoto et al. The Examiner further cites Ramaswami et al. for supporting the using of NRZ. Ramaswami et al. teaches on page 179, 8th line from the bottom, "In practice, the NRZ format is used in most high-speed communication systems." One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible with most other communication systems and can reuse most part of the design and components of other communication systems. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use NRZ for transmission, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. to use NRZ for transmission because it is compatible with most other communication systems and can reuse most part of the design and components of other communication systems.

The Applicant argues that the equivalence of the transmission characteristics of Miyamoto to the recited transmission characteristic is not recognized in the prior art. However, the Applicant admits that the difference of a factor of 10 and a log is due to the conversion between power ratio and decibels.

The Applicant argues that neither Bigo nor Miyamoto teaches “maximizing a product of a transmission distance and a transmission capacity of the system” as recited in claim 1.

However, the statement is considered as an objective, or intended purpose of the filters and does not carry patentable weight.

The Applicant argues "Miyamoto, moreover, does not even use a super Gaussian filter. Miyamoto, rather, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter. In particular, as described at column 30, line 51:

An actual (actually-used) flat-top type AWG filter.

It is submitted, therefore, that persons of ordinary skill in the art who read Miyamoto for all it contained at the time the invention was made would not have modified Bigo as proposed in the final Office Action, since Miyamoto himself rejects a super Gaussian filter in favor of the AWG filter." The Examiner disagrees. The fact is that Miyamoto teaches that a Gaussian filter with of order 1 is not good enough; instead, a Gaussian filter with order greater than 1 (super-Gaussian) or an AWG filter should be used. FIG. 44D shows that the performance of an AWG filter is between that of a Gaussian filter of order 1 and that of a Gaussian filter of order 2.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (7:30 a.m. - 4:30 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

skl
28 February 2009

/Shi K. Li/
Primary Examiner, Art Unit 2613